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Calculator Exam – 2012

Directions: Select the answer to each question which is closest to the actual answer. For example, suppose a question requests the value of $\sin(2)$. Your calculator will tell you that $\sin(2)$ is approximately 0.9092974268. Now suppose the answer choices are

- a. .3
- b. .55
- c. .75
- d. .95
- e. .85

Then the correct response is d.

1. $213^2 - \frac{1429}{13} - 3721.32 + \pi^6 =$

- a. 42499.12412
 - b. 42499.13512
 - c. 42499.14612
 - d. 42499.15712
 - e. 42499.16812
2. Give the total number of seconds in 2012.
- a. 31622400
 - b. 31632400
 - c. 31642400
 - d. 31652400
 - e. 31662400
3. Give the sum of the positive roots of $x^3 - 10x = -3$.
- a. 3.3005756
 - b. 3.3016756
 - c. 3.3027756
 - d. 3.3038756
 - e. 3.3049756
4. Give the average of the values $\frac{1}{2}, 3, \frac{1}{4}, 5, \frac{1}{6}, 7, \dots, 99, \frac{1}{100}$.
- a. 25.2640475
 - b. 25.2651475
 - c. 25.2662475
 - d. 25.2673475
 - e. 25.2684475

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5. $f(x) = \frac{2x^3 + 3x^2 - 7}{x^4 + 2x^2 + 2} \cdot \frac{f(6) - f(5)}{f(4) - f(3)} =$
- 0.5380945558
 - 0.5480955558
 - 0.5580965558
 - 0.5680975558
 - 0.5780985558
6. The graphs of the functions $f(x) = x^3 - 10x + 3$ and $g(x) = x^2 - 3$ intersect in 3 points. These points determine a triangle. Find the length of the longest side of this triangle.
- 11.66150079
 - 11.66160179
 - 11.66170279
 - 11.66180379
 - 11.66190479
7. Give the x coordinate of the solution to the system $\begin{cases} 12.97x - 37.74y = 63.12 \\ 11.98x + 24.63y = 108.32 \end{cases}$.
- 7.3731355789
 - 7.3631356789
 - 7.3531357789
 - 7.341358789
 - 7.3131359789
8. Give the greatest common divisor of 256713216 and 563199864.
- 12
 - 18
 - 24
 - 28
 - 36
9. Give the slope of the line of best least squares fit for the data (1,2), (2,4), (3,3) and (4,5).
- 0.75
 - 0.80
 - 0.85
 - 0.90
 - 0.95

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10. $h(x) = \frac{x}{2} + \frac{1}{x^2}$. Define the values $x_1 = 1$, $x_2 = h(x_1)$, $x_3 = h(x_2)$, ..., $x_{10} = h(x_9)$.

Give the value of x_{10} .

- a. 1.2644412977
- b. 1.2634512977
- c. 1.2624612977
- d. 1.2614712977
- e. 1.2604812977

11. $\sum_{k=1}^{100} \frac{2k-1}{k^2+1} =$

- a. 7.9243578552
- b. 7.9343678552
- c. 7.9443778552
- d. 7.9543878552
- e. 7.9643978552

12. Give the number of points of intersection of the graphs of $f(x) = \frac{2x^3 + 3x^2 - 7}{x^4 + 2x^2 + 2}$ and

$$g(x) = \sin(5x) + \frac{1}{100}x^2.$$

- a. 27
- b. 28
- c. 29
- d. 30
- e. 31

13. Give the smallest value of the function $f(x) = x - \frac{1}{6}x^3 + \frac{1}{120}x^5 - \frac{1}{5040}x^7$ on the interval $[-3, 2]$.

- a. -0.9998232997
- b. -0.9998333997
- c. -0.9998434997
- d. -0.9998535997
- e. -0.9998636997

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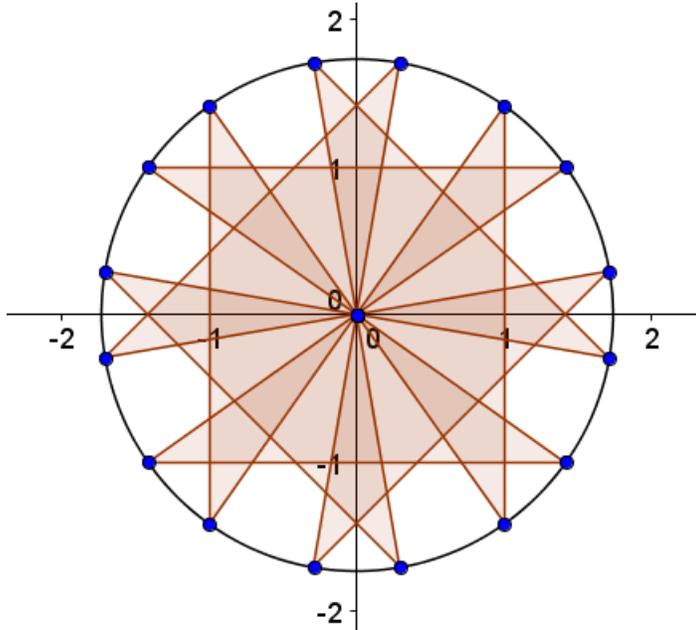
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14. A number x is chosen, and a list of numbers is created with x being the first number. The 2nd number is 3 times the 1st, the 3rd number is x^2 minus the 2nd, the 4th number is the 3rd number times x , and the 5th number is the 4th number cubed. The 6th number minus the 5th number is 10, and the average of the 5th and 6th numbers is 31. Give the value of x .
- 3.2760331314
 - 3.2761431314
 - 3.2762531314
 - 3.2763631314
 - 3.2764731314
15. A rectangle is situated so that its base is on the x axis, its left side is on the y axis, its lower left vertex is at the origin, and its upper right vertex lies on the graph of $h(x) = 27 - x^4 - x^2 - \frac{1}{2}x$. Give the length of the base of the rectangle if its dimensions give it the largest possible area.
- 1.4079048613
 - 1.4179058613
 - 1.4279068613
 - 1.4379078613
 - 1.4479088613
16. The circles $x^2 + y^2 = 5$ and $(x - 3)^2 + (y - 1)^2 = 7$ intersect in 2 points. One of these points lies in the first quadrant, and we name it P . Find the x coordinate of the vertex of the parabola that passes through the point P and the 2 centers of the circles.
- 1.6220237125
 - 1.6230337125
 - 1.6240437125
 - 1.6250537125
 - 1.6260637125

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17. The figure below was obtained by first sketching the triangle with vertices $(0,0)$, $(1,\sqrt{2})$ and $(1,-\sqrt{2})$, and then creating new triangles by rotating this triangle about the origin by integer multiples of 45° . Finally, a circle was drawn through the outer vertices of the triangles. Give the area of the region which is inside the circle and outside all of the triangles.



- a. 3.7479037113
 - b. 3.7579137113
 - c. 3.7679237113
 - d. 3.7779337113
 - e. 3.7879437113
18. The set S consists of all points in the xy plane whose coordinates are positive integers less than 1000. Give the number of points in S that lie below the graph of $f(x) = 500\cos(100x) + 500$.
- a. 498557
 - b. 498657
 - c. 498757
 - d. 498857
 - e. 498957

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19. A process takes a positive number and continually adds 11 to it until the resulting value is greater than 151. Then it subtracts the original number from this value to obtain the result of the process. Give the average of the results obtained from applying this process to the first 100 positive integers.
- 106.47
 - 106.48
 - 106.49
 - 106.50
 - 106.51
20. Let $A = (1,2)$, $B = (2,5)$, $C = (0,6)$ and $P_0 = (1,1)$. A sequence of points P_1, P_2, \dots, P_{100} is created in the xy plane as follows. Each point P_i is created from the points A, B, C and P_{i-1} by letting j be the remainder when i is divided by 3. If $j = 0$, then P_i is chosen to be the midpoint of the line segment $\overline{P_{i-1}A}$. If $j = 1$, then P_i is chosen to be the midpoint of the line segment $\overline{P_{i-1}B}$. If $j = 2$, then P_i is chosen to be the midpoint of the line segment $\overline{P_{i-1}C}$. Give the sum of the x and y coordinates of P_{100} .
- 5.7142857143
 - 5.7152857143
 - 5.7162857143
 - 5.7172857143
 - 5.7182857143
21. **Tie Breaker:** Do not give your answer to this question on the bubble form. Simply write your answer in the blank below. A triangle is determined by 3 non collinear points. Consider all of the triangles that can be formed using the points (a,b) whose coordinates are positive integers smaller than 21. What is the probability that a randomly chosen triangle has area smaller than 100?

Answer: _____